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ABSTRACT

This document provides teaching guidelines and student material for a unit intended for use in high school science or consumer programs. Time allotment is from four to six hours of classroom time. The objective of this capsule is to investigate the chemical safety of household products by teaching students how to form a hypothesis through the utilization of inference, observation, library resources, and resource people. It also requires them to make careful observations and collect and accurately record data by conducting a survey. The material is presented in two sections. Section I emphasizes the scientific method. Thirteen activities involve students in reading, forming a hypothesis, writing a hypothesis, defining inference, finding and identifying resource persons, writing bibliographies, listing sources, and discussing. Section II focuses on data collecting and recording. Seven activities include listing areas of the home, identifying potential trouble spots, drawing floor plans, and listing ingredients of and warnings for products. The teacher's guide provides advance preparation information, objectives, keys to activities and tests, a bibliography, and copies of all worksheets and assessments. (CK)

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TEACHER'S GUIDE

Investigating the Chemical Safety of Household Products

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Written by
Phil J. Davison

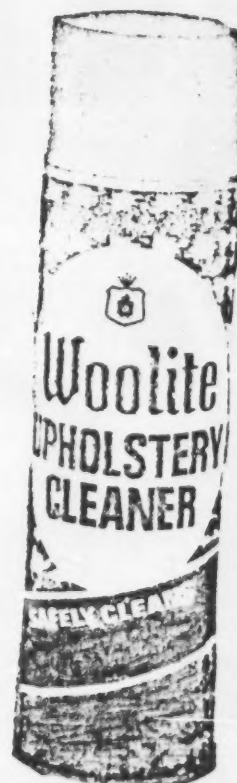
as part of

PROJECT COST

USD # 449

Easton, Kansas

A Title IVC-i Project



PACKAGE RESUME FORM

Publication Date DECEMBER, 1978 Level/Subject 8-12/SCIENCE . . .

Title INVESTIGATING THE CHEMICAL SAFETY OF HOUSEHOLD PRODUCTS

Author PHIL J. DAVISON

Abstract THIS LEARNING CAPSULE IS DESIGNED TO BE APPLICABLE TO A VARIETY OF
APPROACHES TO SCIENTIFIC CONCEPTS OR TOPICS THAT MAY BE ENCOUNTERED IN BIOLOGY,
CHEMISTRY, EARTH SCIENCE, OR ENVIRONMENTAL SCIENCE. IT COULD BE USED TO
REINFORCE A STUDENT'S UNDERSTANDING OF THE SCIENTIFIC METHOD AS A DECISION-
MAKING MODEL. THE CAPSULE EMPHASIZES THE PROCESS(ES) INVOLVED IN FORMULATING
A HYPOTHESIS.

PLEASE NOTE THAT THIS CAPSULE DOES NOT ACCENTUATE EXPERIMENTAL DESIGN.
IT IS PRIMARILY CONCERNED WITH FORMING A HYPOTHESIS THROUGH THE UTILIZATION OF
INFERENCE, OBSERVATION, LIBRARY RESOURCES, AND RESOURCE PEOPLE. HOWEVER, THE
SECOND SECTION DOES REQUIRE THAT THE STUDENT MAKE CAREFUL OBSERVATIONS, COLLECT
AND ACCURATELY RECORD DATA BY CONDUCTING A SURVEY.

INFUSED WITHIN THE CONTEXT OF THE CAPSULE IS AN ENVIRONMENTAL PROBLEM
THAT STUDENTS MUST APPROACH WITH REGARD TO THE CHEMICAL NATURE OF THE HOUSE-
HOLD PRODUCTS THAT THEY ARE EXPOSED TO AS CONSUMERS. THIS IS A FAIRLY NON-
TECHNICAL APPROACH THAT COULD BE FURTHER DEVELOPED IF SO DESIRED.

UPON COMPLETION OF THIS CAPSULE, IT IS HOPED THAT STUDENTS WILL RELATE ENVIRONMENTAL ISSUES TO INDOOR ENVIRONMENTS AS WELL AS OUTDOOR ENVIRONMENTS. IN ADDITION, THEY MAY ALSO DEVELOP AN AWARENESS THAT ENVIRONMENTAL PROBLEMS ARE NOT JUST THE CONCERN OF INDUSTRIES, BUT THE CONCERN OF EVERYBODY.

IT SHOULD BE STRESSED THAT THIS CAPSULE DOES NOT REQUIRE THE STUDENT TO MAKE A FORMAL CONCLUSIVE STATEMENT REGARDING ANY SPECIFIC HOUSEHOLD PRODUCT(S). TO DO THIS WOULD REQUIRE THAT THE STUDENT CONDUCT A CAREFULLY, CONTROLLED EXPERIMENT. THIS PROCESS IS NOT WITHIN THE SCOPE OF THIS CAPSULE. IT MAY BE THAT THIS CAPSULE MAY STIMULATE AND MOTIVATE A STUDENT OR GROUP OF STUDENTS TO FURTHER INVESTIGATE A PARTICULAR HOUSEHOLD PRODUCT OR PRODUCTS.

OBJECTIVES

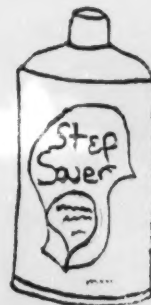
UPON COMPLETION OF THIS LEARNING CAPSULE, YOUR STUDENT WILL BE ABLE TO:

- 1-1. Form a HYPOTHESIS related to an environmental issue.
- 1-2. Explain how INFERENCE is used in formulating a hypothesis.
- 1-3. Evaluate the use of RESOURCE PEOPLE in formulating a hypothesis.
- 1-4. Explain the value of utilizing LIBRARY RESOURCES when formulating a hypothesis.
- 2-1. Apply INFERENCE in identifying household products that may represent a potential hazard in the home environment.
- 2-2. Analyze RECORDED DATA based on ACCURATE OBSERVATIONS of the potential or actual hazards associated with the chemical ingredients of the household products found in your home environment.
- 2-3. Identify the areas of your home environment that may represent potential or actual "trouble spots", in regard to hazardous household products.
- 2-4. Evaluate which class of household chemicals seem to be the most hazardous.

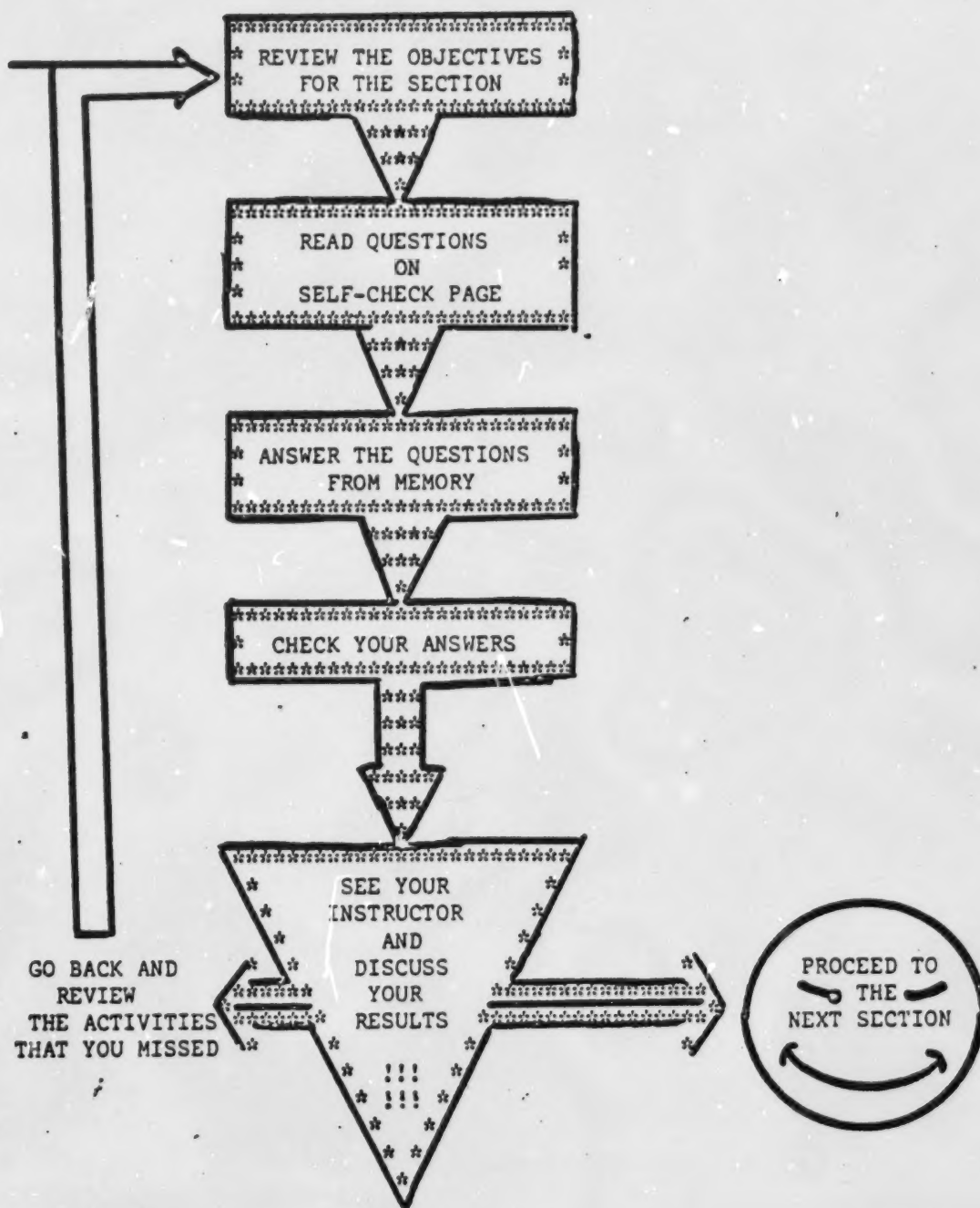


INSTRUCTIONAL SECTION

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2. ALL PAPERS CONCERNING THE ACTIVITIES OF EACH SECTION WILL BE KEPT IN A BINDER AS YOU WOULD A NOTEBOOK.
3. ALL ACTIVITIES PERFORMED SHOULD BE EASILY DISTINGUISHED BY USING THE SAME NUMBERING SYSTEM IN YOUR NOTEBOOK THAT THIS CAPSULE USES FOR THE ACTIVITIES. FOR EXAMPLE, 2-1 REPRESENTS THE FIRST ACTIVITY OF THE SECOND SECTION.
4. PLEASE NOTE THAT SOME ACTIVITIES ARE REQUIRED WHILE OTHERS MAY BE OPTIONAL. YOU MAY BE REQUESTED TO DO TWO OF THREE ACTIVITIES OR ANY ONE OF THREE. IT IS HIGHLY RECOMMENDED THAT YOU CAREFULLY READ ALL OF THE CHOICES BEFORE DECIDING WHICH WOULD BE THE BEST LEARNING EXPERIENCE FOR YOU.
5. SELF-CHECKS ARE PROVIDED AT THE END OF EACH SECTION SO THAT YOU CAN DETERMINE WHAT YOU KNOW OR DO NOT KNOW. THE SELF-CHECKS ARE DESIGNED SO THAT YOU WILL KNOW WHAT SECTIONS OF THE CAPSULE NEED TO BE REVIEWED BEFORE ATTEMPTING THE POST-ASSESSMENT. FOR THE SELF-CHECK PROCEDURE, PLEASE SEE THE FLOW CHART ON THE NEXT PAGE.
6. YOU WILL KEEP A RECORD OF YOUR ACHIEVEMENTS ON THE STUDENT'S ACTIVITIES CHECK LIST FORM PROVIDED TO YOU BY YOUR INSTRUCTOR. THIS FORM SHOULD BE IN YOUR NOTEBOOK AT ALL TIMES.



SELF-CHECK FLOW CHART



PRE - TEST EXPLANATION

THE PRE-TEST ON THE FOLLOWING PAGE IS DESIGNED TO ASSESS WHAT THE STUDENT MAY ALREADY KNOW OR WHAT HE/SHE DOESN'T KNOW. IN ADDITION, THE QUESTIONS HELP GIVE THE STUDENT A LITTLE MORE INSIGHT INTO WHAT SOME OF THE OUTCOMES OF THE CAPSULE WILL BE.

IF A STUDENT DOES EXCEPTIONALLY WELL IN ONE OR MORE AREAS OF THE PRE-TEST, THEN YOU MAY WANT TO ADAPT THE CAPSULE'S ACTIVITIES TO THE STUDENT'S BACKGROUND. THIS MAY BE DONE BY DELETING SOME OF THE REQUIRED ACTIVITIES OR BY SUPPLEMENTING OTHER ACTIVITIES WITH THE STUDENT'S OR YOUR OWN IDEAS.

SELF-CHECK ?

NOW THAT YOU HAVE COMPLETED THE FIRST SECTION OF THE LEARNING CAPSULE, IT IS TIME TO CHECK YOURSELF TO FIND OUT IF YOU HAVE ACCOMPLISHED ALL OF THE OBJECTIVES FOR THIS SECTION.

WITHOUT REFERRING BACK TO YOUR NOTES OR RESOURCES, ANSWER THE FOLLOWING QUESTIONS ON NOTEBOOK PAPER. WHEN YOU HAVE FINISHED THE SELF-CHECK, YOU SHOULD REFER BACK TO YOUR NOTES OR OTHER RESOURCES TO CHECK FOR CORRECT OR INCORRECT ANSWERS. DO NOT CHANGE ANY INCORRECT ANSWERS AT THIS POINT. REFER TO THE FLOW CHART IN THE SPECIAL INSTRUCTIONS SECTION AT THE FRONT OF THIS CAPSULE FOR FURTHER DIRECTIONS.

- 1. What is a SCIENTIFIC METHOD?
2. What is a HYPOTHESIS?
3. How can INFERENCE help you to solve a problem?
4. What role does the LIBRARY play in aiding to solve a problem?
5. What is a RESOURCE PERSON?
6. List at least five ways that OBSERVATIONS may be made.
7. Name at least four things that may be used to formulate a hypothesis.

SELF-CHECK ?

NOW THAT YOU HAVE COMPLETED THE SECOND SECTION OF THE LEARNING CAPSULE, IT IS TIME TO CHECK YOURSELF TO FIND OUT IF YOU HAVE ACCOMPLISHED ALL OF THE OBJECTIVES FOR THIS SECTION.

WITHOUT REFERRING BACK TO YOUR NOTES OR RESOURCES, ANSWER THE FOLLOWING QUESTIONS ON NOTEBOOK PAPER. WHEN YOU HAVE FINISHED THE SELF-CHECK, YOU SHOULD REFER BACK TO YOUR NOTES OR OTHER RESOURCES TO CHECK FOR CORRECT OR INCORRECT ANSWERS. DO NOT CHANGE ANY INCORRECT ANSWERS AT THIS POINT. THE RESULTS OF THIS SECTION MAY VARY FROM STUDENT TO STUDENT SO BE CONCERNED ONLY WITH YOUR RESULTS. REFER TO THE FLOW CHART IN THE SPECIAL INSTRUCTIONS SECTION AT THE FRONT OF THE CAPSULE FOR FURTHER DIRECTIONS.

1. Where are most of the hazardous household products located in your home?
2. What class of household products seem to be the most hazardous?
3. Describe at least two ways that your home environment could be made safer, in regard to the chemicals used in your home.

pre-test key

1. F
2. C
3. A
4. E
- 5.
6. B
7. D
8. Answers will vary. Accept any logical answer that indicates that student meets criterion of objectives. Bathroom, kitchen, garage are examples.
9. Answers will vary. Accept any logical answer that student meets criterion of objectives.
10. Answers will vary. Examples might include : eliminate usage, substitute products or methods.

post-assessment key

1. D
2. A
3. OBSERVATIONS may be made through our senses of sight, sound, taste, touch and smell. Instruments like gas chromatographs, microscopes, rulers, amplifiers, balances, spectrosopes and other instruments serve to expand the sensitivity of our senses.
4. Inference, observation, resource people and library resources may be used to formulate a hypothesis.
5. Answers may vary. Bathroom, kitchen, garage and utility room are possible answers. Accept others that indicate student has met criterion of objectives.
6. Answers will vary. Accept answers that student has met criterion of objectives.
7. Answers will vary. Eliminate usage. Substitute products or methods. Accept other answers that indicate student has met criterion of objectives.

suggested readings

Most science textbooks will contain information that relates to the scientific method. Information about agencies that deal with consumer and environmental issues can be found at local, state, and federal levels of government.

The below list contains resources that were helpful in the writing of the capsule.

Center for Science in the Public Interest, The Household Pollutants Guide. Garden City, New York: Anchor Press/Doubleday, 1978. Describes over 100 harmful substances found in the home. It offers suggestions as to how to learn what substances are dangerous and how to make safe substitutions for those substances.

Kaskel, Albert, LABORATORY BIOLOGY: Investigating Living Systems. Columbus, Ohio: Merrill Publishing Company, 1976, pp. 15-19. Contains a laboratory investigation that deals with solving a problem with the scientific method.

Neal, Harry E., THE PROTECTORS: The Story of the Food and Drug Administration. New York: Julian Messner Publishing, 1968. Describes the role of the FDA as a governmental agency concerned with protecting the American consumer.

Otto, James H., Modern Biology. New York: Holt, Rhinehart, and Winston, Inc., 1977, pp. 8-12. Presents an excellent explanation of the scientific method from the standpoints of the research and technical methods.

Percivall, Julia, Household Ecology. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971. Emphasizes the individuals role and responsibility in saving the environment. Includes recipes and substitutions that any consumer can benefit from.

Roelofs, Robert T., Environment and Society. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1974. Several readings center upon the topic of "Survival and the Quality of Life." Also, is a reading entitled "Criteria for an Optimum Human Environment."

Smallwood, William L., Biology. Morristown, NJ: Silver-Burdett, 1977, pp. 7-8. Presents an explanation and chart contrasting Aristotle's Method of Inquiry with the Present-Day Method of Inquiry.

- Smoot, Robert, CHEMISTRY: A Modern Course. Columbus, Ohio: Merrill Publishing Company, 1975, pp. 5-7. Concerned with making daily decisions which affect the environment and natural resources.
- Stark, Norman H., The Formula Manual (3rd ed.). Cedarburg, Wisconsin: Stark Research Corporation, 1975. Contains more than 475 formulas for "homemade" versions of household products that are purchased on the market.
- Turk, Amos, Environmental Science. Philadelphia, PA: W.B. Saunders Company, 1978. A very thorough book that deals with a variety of topics centered on ecology, pollution, and environmental protection. It contains many "take-home" experiments concerning the forementioned topics.
- Wolozin, Harold, The Economics of Pollution. Morristown, NJ: General Learning Press, 1974. Presents readings that approach the problem of pollution as an economic dilemma.

APPENDIX

This appendix contains copies of all worksheets and assessments. These copies may be used to make your own classroom quantity copies. To use, unstaple the sides of the teacher's guide and remove the worksheet and assessment pages. Restaple the remaining pages of the teacher's guide.

STUDENT'S⁵ ACTIVITIES CHECK LIST FORM

SECTION ONE:													
Do Two			Do One		Do Two			Do Two			Do One		
ACTIVITIES:	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13
*	:	:	:	:	:	:	:	:	:	:	:	:	:
OBJECTIVES:													
* 1-1	:	:	:	:	:	:	:	:	:	:	:	:	:
* 1-2	:	:	:	:	:	:	:	:	:	:	:	:	:
* 1-3	:	:	:	:	:	:	:	:	:	:	:	:	:
* 1-4	:	:	:	:	:	:	:	:	:	:	:	:	:
* 1-5	:	:	:	:	:	:	:	:	:	:	:	:	:

SECTION TWO:							
Required					Do One		
ACTIVITIES:	2-1	2-2	2-3	2-3	2-6	2-7	
*	:	:	A	B	C	:	:
OBJECTIVES:							
* 2-1	:	:	:	:	:	:	:
* 2-2	:	:	:	:	:	:	:

Instructions

STUDENTS: This is a general purpose check list on which you can keep track of the activities of this capsule which you have chosen and completed. The correct number of each Activity is given from left to right on the horizontal row above the grid. The number of each Objective is listed on the vertical row to the left of the grid.

MATCH THE OBJECTIVE WITH EACH ACTIVITY YOU ACCOMPLISH AND PUT A CHECK (✓) IN THE PROPER BOX.

Re-test ...



I. Match Column A to Column B.

COLUMN A

- A. hypothesis
- B. inference
- C. scientific method
- D. resource person
- E. observations
- F. experimentation

COLUMN B

- _____ 1. Controlled inquiry to provide answers to problems
- _____ 2. Logical, orderly procedure that can be used to make a decision.
- _____ 3. An educated guess or prediction.
- _____ 4. Made through the use of one's senses.
- _____ 5. Method of analyzing information gained.
- _____ 6. Using past knowledge to help solve a problem
- _____ 7. Provides information that is pertinent to the question

II. Answer these questions.

- 8. Where are most of the hazardous household products located in your home?
- 9. What class of household products seem to be the most hazardous?
- 10. Describe at least two ways that your home environment could be made safer, in regard to the chemicals used in your home.



Post - Assessment ... ?

I. Circle the letter of the correct answer.

1. A logical, orderly procedure that can be used to solve a problem is called
 - (a) common sense
 - (b) discussion
 - (c) experimentation
 - (d) the scientific method
2. An educated guess or prediction concerning the answer to a problem is termed
 - (a) a hypothesis
 - (b) an inference
 - (c) analysis
 - (d) observation

II. Answer the following questions.

3. List five ways (at least five) that OBSERVATIONS may be made.
4. Name at least four things that may be used to formulate a hypothesis.
5. Where are most of the hazardous household products located in your home?

7. Describe at least two ways that your home environment could be made safer in regard to the chemicals used in your home.

**SEE YOUR
INSTRUCTOR**



CONSUMER ISSUES



Investigating the Chemical Safety of Household Products



Student Material

Written by

Phil J. Davison

Project COST

ESEA Title IV

Kansas State Dept. of Education

USD 449

Easton, KS 66020

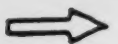


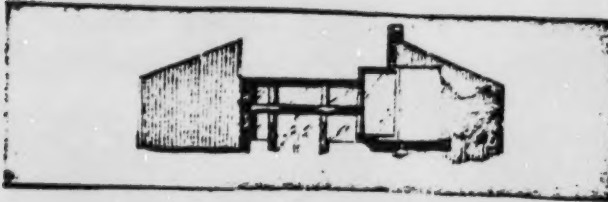
INTRODUCTION



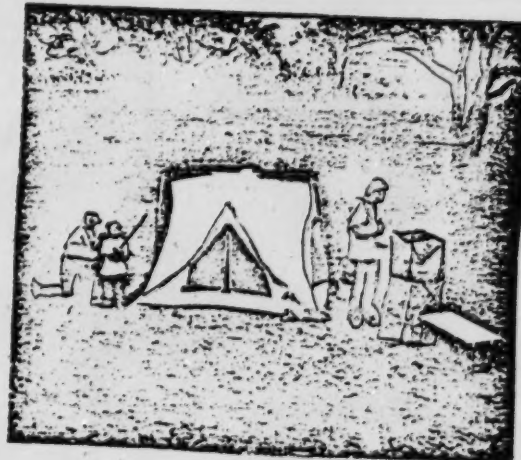
What comes to your mind when you are asked to think about your home? Can you remember a time when you were glad to get home after being away on a trip? Or perhaps you can recall a time when you came inside your home from a cold and icy winter day? If these questions were asked to a group of people, we would probably get many different answers. However, most of us would agree that homes are very special places to people.

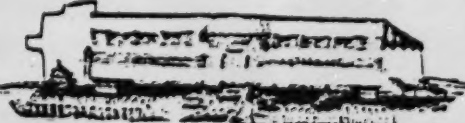
Essentially, a home is a place to live that provides for our basic needs of security, safety, and shelter from things in our environment. Things like rain, snow, hail, wind, and animals. Animals? Yes, animals! Maybe this is not as evident in today's life styles, but in the past this was an important feature of homes. Especially, if you happened to be a caveman living in a cave.



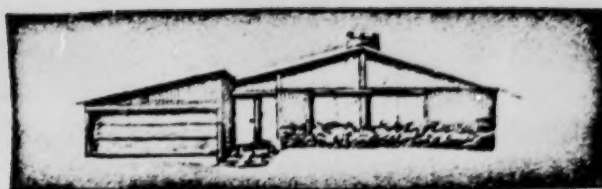


Speaking of caves,
let's remember that homes
should not be limited to
just a few styles. The
appearances of homes have
been constantly changing
with the times. Our
definition of a home would
include cabins, apartments,
wheeled-vacation trailers,
condominiums, campers,
duplexes, tents, mobile
homes, and yes, even caves.

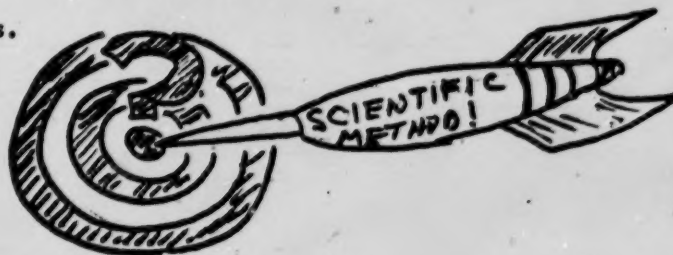


Condominium	
Mobile home	

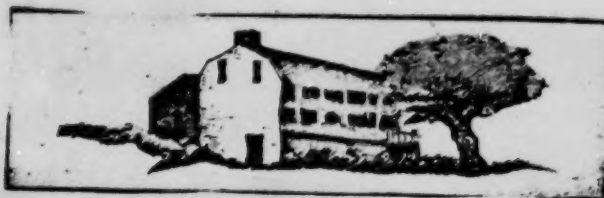




But what does all of this have to do with investigating an environmental problem? Good question! Too often we tend to think of environmental problems as occurring only on an industrial level. In other words, we usually consider environmental issues as being outdoor problems. It is easy to see why environmental crises or pollution may appear to be occasional happenings that we view on television or read about from the isolated comfort and safety of our own homes. But are we really that safe in the 'isolation' of our homes? It is this question that is the primary target of the capsules concerned with investigating environmental problems that may exist in our homes.



The following investigations are concerned with helping you answer the above question. The capsules are designed with the intention of developing a somewhat logical and orderly sequence of conducting the investigation. The method that you will use to answer the question will follow a scientific method.





OBJECTIVES

UPON COMPLETION OF THIS LEARNING CAPSULE, YOU WILL BE ABLE TO:

- 1-1. Form a HYPOTHESIS related to an environmental issue.
- 1-2. Explain how INFERENCE is used in formulating a hypothesis.
- 1-3. Evaluate the use of RESOURCE PEOPLE in formulating a hypothesis.
- 1-4. Explain the value of utilizing LIBRARY RESOURCES when formulating a hypothesis.
- 1-5. Evaluate the use of various forms of OBSERVATION in the formation of a hypothesis.
- 2-1. Apply INFERENCE in identifying household products that may represent a potential hazard in the home environment.
- 2-2. Analyze RECORDED DATA based on ACCURATE OBSERVATIONS of the potential or actual hazards associated with the chemical ingredients of the household products found in your home environment.
- 2-3. Identify the areas of your home environment that may represent potential or actual "trouble-spots", in regard to hazardous household products.
- 2-4. Evaluate which class of household chemicals seem to be the most hazardous.



Retest Instructions



You as a consumer are exposed, either directly or indirectly, to a variety of chemicals that are ingredients of many common household products. While one outcome of this learning capsule is to familiarize you with the components of these products, another is to familiarize you with a problem-solving or decision-making process. This process is often called different names, but in this case, we shall refer to the process as the scientific method.

Please look carefully at the following questions on the Pre-Test that relate to the objectives of this learning capsule. You may already know the answers to one or more of the questions. Those questions you are unable to answer will give you an idea of the kinds of things you are going to learn about. Do your best to answer all the questions, but don't get frustrated if you cannot.

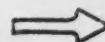
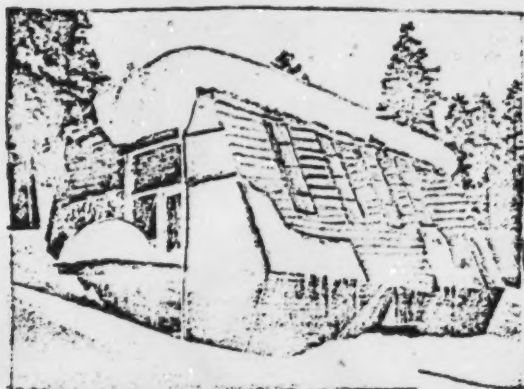
Write your answers on a separate sheet of paper and upon completion turn in the paper to your teacher. He will check them for you and provide you with further instructions concerning the learning capsule.



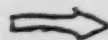
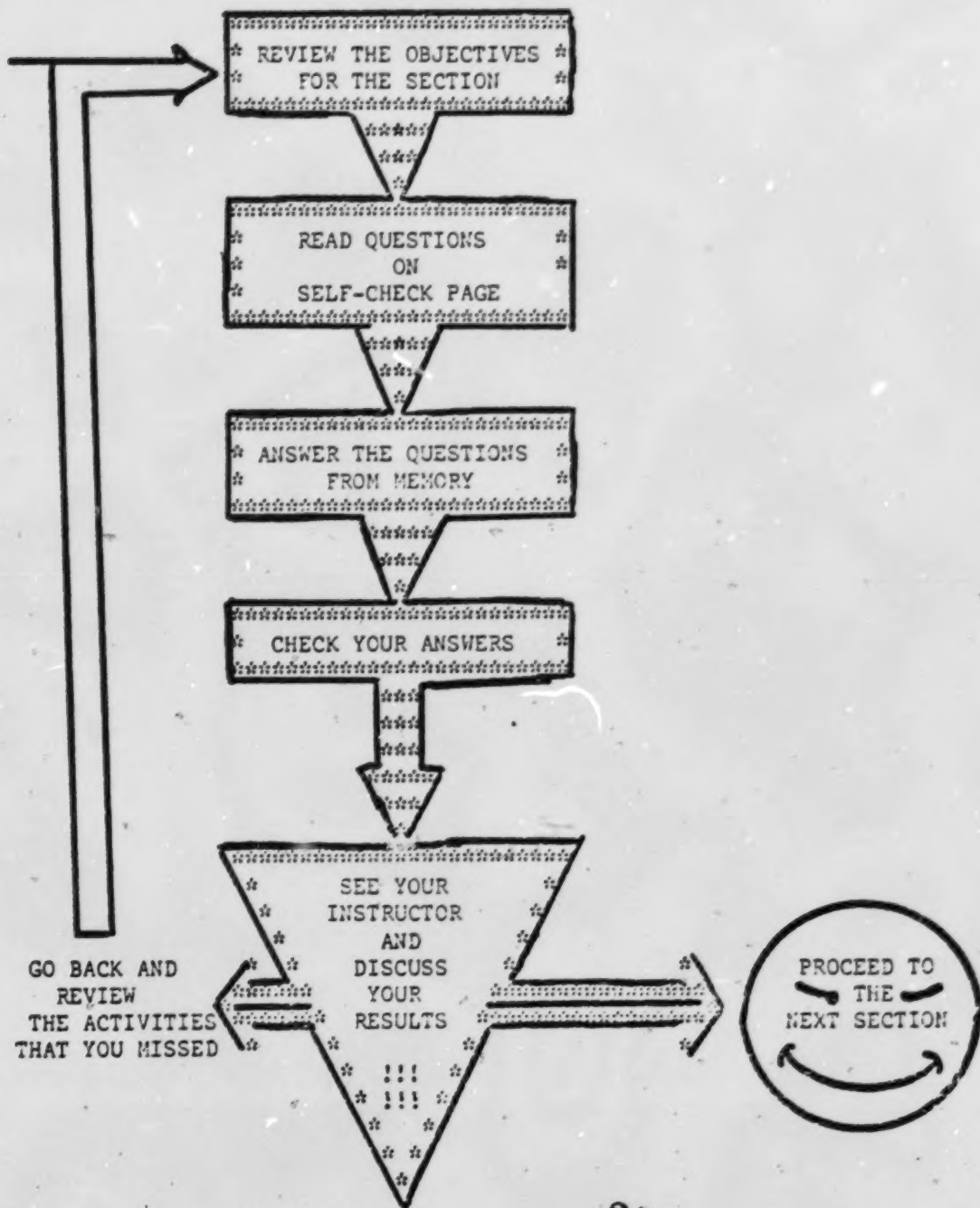


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SELF-CHECK FLOW CHART



STUDENT'S ACTIVITIES CHECKLIST FORM

SECTION ONE:													
Do Two			Do One		Do Two		Do Two			Do One			
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*	:	:	:	:	:	:	:	:	:	:	:	:	:
OBJECTIVES:													
*	1-1	:	:	:	:	:	:	:	:	:	:	:	:
*	:	:	:	:	:	:	:	:	:	:	:	:	:
*	1-2	:	:	:	:	:	:	:	:	:	:	:	:
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*	1-5	:	:	:	:	:	:	:	:	:	:	:	:
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SECTION TWO:						
Required				Do One		
ACTIVITIES:	2-1	2-2	2-3	2-3	2-6	2-7
*	:	:	A	B	C	:
OBJECTIVES:						
*	2-1	:	:	:	:	:
*	:	:	:	:	:	:
*	2-2	:	:	:	:	:
*	:	:	:	:	:	:

instructions

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MATCH THE OBJECTIVE WITH EACH ACTIVITY YOU ACCOMPLISH AND PUT A CHECK (✓) IN THE PROPER BOX.



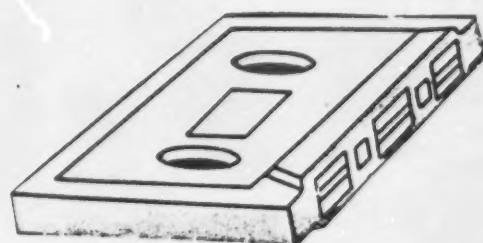
ARCO

SECTION

GTE



ONE

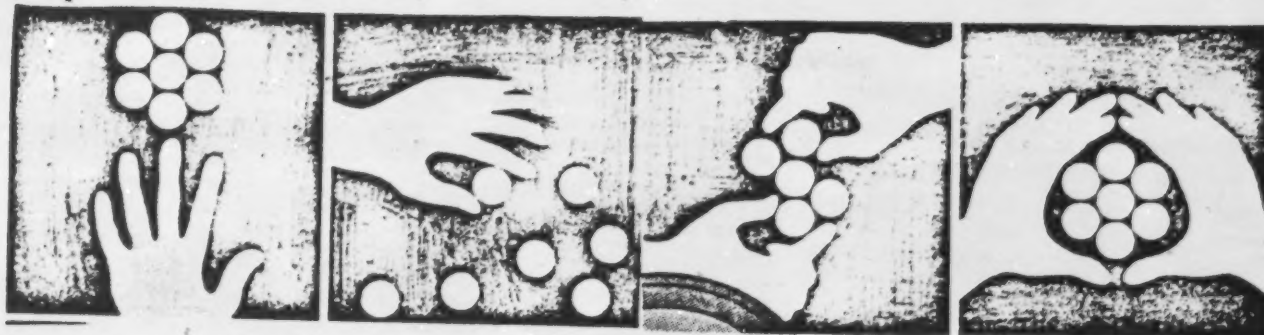


SCIENTIFIC METHOD
INFERENCE + OBSERVATION
RESOURCES: PEOPLE + LIBRARY



HYPOTHESIS



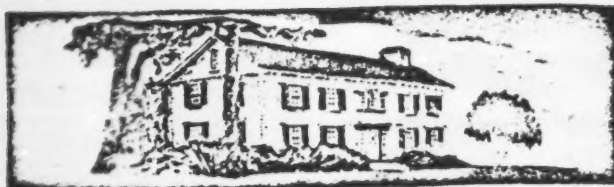


Perhaps you have already formed a possible answer to the question of the safety of your home in environmental terms. If you have, then you have formed a hypothesis. A hypothesis is an educated guess or prediction. What enabled you to form a hypothesis? Sometimes we rely on our past experiences to help us solve a new problem. This is known as using inference.

But what if the situation or problem is entirely a new and foreign experience to you? How would you solve the problem or form a hypothesis then? Maybe you could find someone who has experienced the situation. These people are sometimes called resource people. Or perhaps someone else has investigated the problem and written about it; in order to share his experiences. A library contains a large amount of shared experiences through books, magazines, journals, newspapers, tapes, and video-cassettes.

There is always the chance that while a resource person and the library are helpful, they still do not adequately answer your question. In this case YOU are the means to the solution of the problem. Before you can form a hypothesis, maybe you should try to "experience" the problem more intensely through observation.





The main idea of this part of the capsule is that a hypothesis may be formulated by several means. Regardless of how we may form the hypothesis, the end result is usually the same and it is more important to view a hypothesis as a motivator that focuses our effort to solve a problem in a better defined and directed manner.

HYPOTHESIS

Upon the completion of this part of the learning capsule, you will be able to:

- 1-1. Form a HYPOTHESIS related to an environmental issue.
- 1-2. Explain how INFERENCE is used in formulating a hypothesis.
- 1-3. Evaluate the use of RESOURCE PEOPLE in formulating a hypothesis.
- 1-4. Analyze the relationship of resource people to various LIBRARY resources in regard to formulating a hypothesis.
- 1-5. Evaluate the use of various forms of OBSERVATION in the formation of a hypothesis.

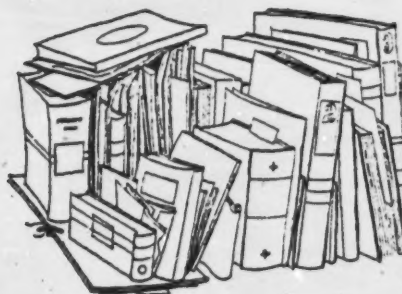


**Monsanto
the science
company.**





BOOKS



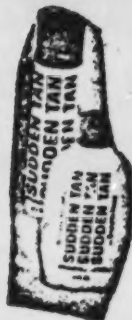
DO ANY TWO OF THE FOLLOWING THREE:

- 1-1. Select at least two introductory science textbooks of different disciplines (biology, chemistry, physics, earth science, general science, environmental science, physical science, etc.) that explain what a hypothesis is. After reading their explanations, WRITE a summary of each book's description of a hypothesis. Note any similarities and differences that may exist. Be sure to include a bibliography of each book used at the end of your summary.
- 1-2. Given the question, "Are we isolated and safe from environmental issues, such as pollution, in our own homes?" form a hypothesis that identifies YOUR stand on this issue. NOTE: Has your hypothesis explained the why or why not of the issue? Have you limited the hypothesis to a statement of one or two sentences? WRITE your hypothesis and place it in your notebook or file.
- 1-3. WRITE a hypothesis for each of the following environmental questions. At this point do not be overly concerned with being right or wrong.
 - (a) Will continued depletion of natural resources (coal, oil, forest, mineral) effect the quality of life?
 - (b) Does the agribusiness need to continue the use of such insecticides as DDT for pest control?
 - (c) Is it necessary that our upper atmosphere contain 0.02 ppm of ozone?
 - (d) Do soy bean plants require oxygen for normal growth?

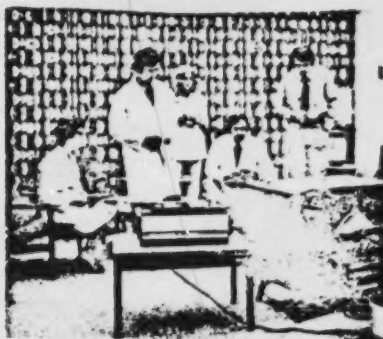
DO ONE OF THE NEXT TWO:

- 1-4. Using the description in the introduction portion of this section and/or a dictionary read a description of inference. In YOUR own words, WRITE an explanation or definition of inference.
- 1-5. DESCRIBE a situation in which YOU used inference to solve or help solve a problem.





13



DO ANY TWO OF THE FOLLOWING THREE:

- 1-6. In YOUR own words, EXPLAIN what a resource person and GIVE an example of someone you know that could serve as a resource person in any area of science. is
- 1-7. Using a telephone directory, newspaper, or inference, LIST the name and address of a person who could be contacted to serve as a resource person in each of the following areas: (An agency could be used).
- | | |
|--|---|
| (a) Soil Conservation | SPECIFY WHAT SOURCE
OF INFORMATION WAS
USED FOR EACH AREA |
| (b) Household Garbage Disposal Equipment | |
| (c) Population (Human) Control | |
| (d) Legal Assistance | |
| (e) Pest Control | |
| (f) Medical Assistance | |
| (g) Animal Information | |
| (h) Plant Information | |
- 1-8. Contact a librarian and ask if they have a directory that contains the names and addresses of people or agencies that are directly concerned with consumer and/or environmental problems. (The librarian may be able to refer you elsewhere if this material is lacking in their facility.) WRITE a letter to at least two people or agencies requesting information about the services they provide concerning environmental and/or consumer-oriented problems. Place a copy of the letters you write and their replies in your folder or notebook.

EXON

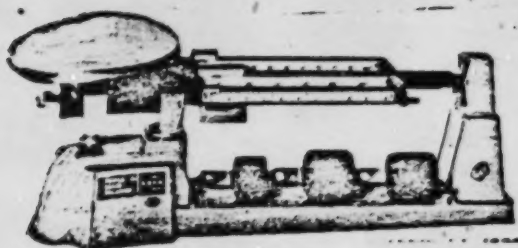
DO TWO OF THE FOLLOWING THREE:

- 1-9. In YOUR own words, EXPLAIN why a library is sometimes useful in the formulation of a hypothesis.
- 1-10. WRITE the bibliographies for at least five different books, magazines, or journals that contain information concerning the following:
- (a) The Pine Beetle Epidemic on the Eastern Slope of the Colorado Rockies.

ITT

Western Electric





CONTINUED FROM ACTIVITY 1-10.



- (b) Legislation and Public Policy Concerning Noise Control.
- (c) Algae and Detergents.
- (d) Environmental Hazards from Fission Reactors.
- (e) Effects of Insecticides on Human Health.
- (f) Household Pollutants.
- (g) The Donora, Pennsylvania Smog Episode.
- (h) How to Conserve Energy in Home Heating and Cooling.
- (i) Recycling of Beverage Containers.
- (j) Effects of Population Change in the Developing Countries.

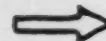
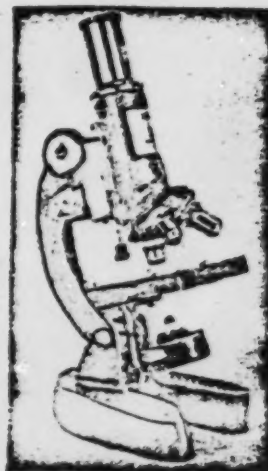
[NOTE: Only one Bibliography is needed for each of the above, BUT at least five different sources should be used.]

- 1-11. LIST and DESCRIBE at least six (6) magazines and four (4) scientific journals that are concerned with problems of a consumer and/or environmental nature. Your description should be centered upon the primary interests of the magazine or journal.

DO ONE OF THE FOLLOWING:

- 1-12. EXPLAIN how observations could be made using each of our five senses. Use a biology or health text as a resource.
- 1-13. DISCUSS how each of our five senses have been extended through the development of modern instruments (for example microscopes, gas chromatographs, etc.) You may want to consult a science textbook for examples. Give one example for each sense.

Republicsteel
The new steel company



SELF-CHECK ?

NOW THAT YOU HAVE COMPLETED THE FIRST SECTION OF THE LEARNING CAPSULE, IT IS TIME TO CHECK YOURSELF TO FIND OUT IF YOU HAVE ACCOMPLISHED ALL OF THE OBJECTIVES FOR THIS SECTION.

WITHOUT REFERRING BACK TO YOUR NOTES OR RESOURCES, ANSWER THE FOLLOWING QUESTIONS ON NOTEBOOK PAPER. WHEN YOU HAVE FINISHED THE SELF-CHECK, YOU SHOULD REFER BACK TO YOUR NOTES OR OTHER RESOURCES TO CHECK FOR CORRECT OR INCORRECT ANSWERS. DO NOT CHANGE ANY INCORRECT ANSWERS AT THIS POINT. REFER TO THE FLOW CHART IN THE SPECIAL INSTRUCTIONS SECTION AT THE FRONT OF THIS CAPSULE FOR FURTHER DIRECTIONS.

1. What is a SCIENTIFIC METHOD?
2. What is a HYPOTHESIS?
3. How can INFERENCE help you to solve a problem?
4. What role does the LIBRARY play in aiding to solve a problem?
5. What is a RESOURCE PERSON?
6. List at least five ways that OBSERVATIONS may be made.
7. Name at least four things that may be used to formulate a hypothesis.

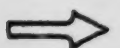
CHECK WITH YOUR
INSTRUCTOR

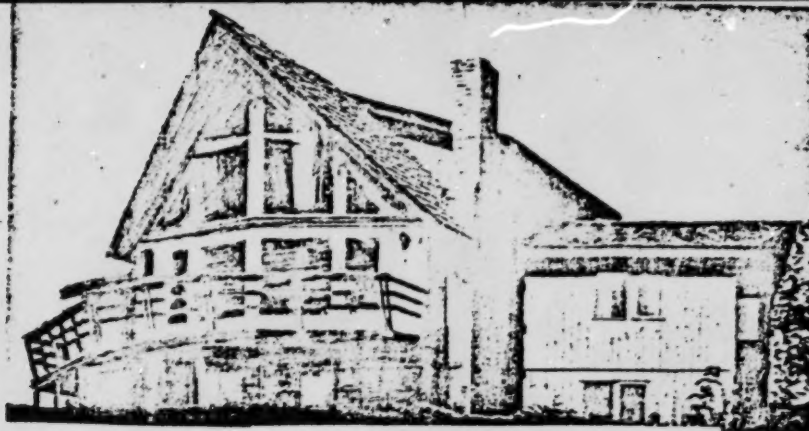


SECTION TWO

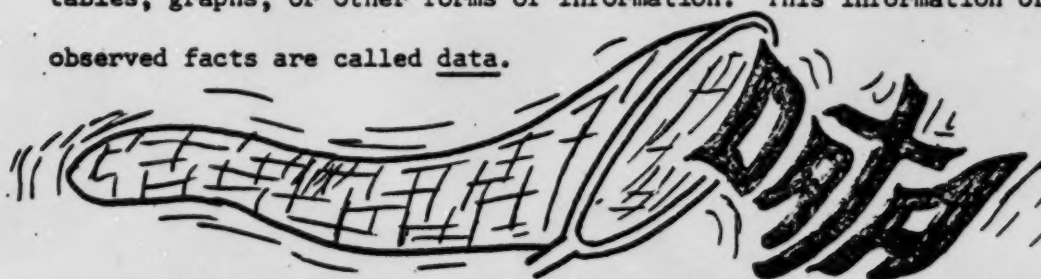
CAREFUL OBSERVATION
ACCURATE + RECORDS =

DATA





CONGRATULATIONS! Now that you have successfully completed the first section of this learning capsule, let's proceed to the next section. This section's main idea emphasizes the importance of making careful observation and recording those observations in such a way that they can be remembered in a meaningful and accurate way at a later time. The recordings may consist of notes, drawings, tables, graphs, or other forms of information. This information or observed facts are called data.



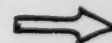
This section will allow you to apply both the principles of inference and recording data (information) based upon observations to an investigation dealing with some household products that may present health, safety, or environmental problems in our home.

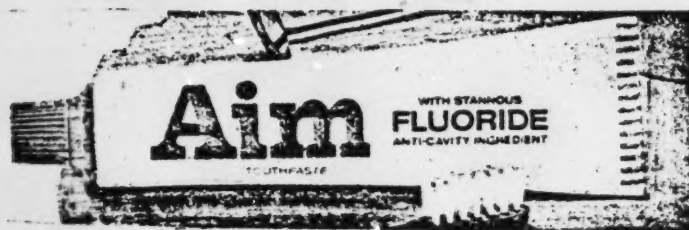
Upon the completion of this part of the learning capsule, you will be able to:

- 2-1. Apply INFERENCE in identifying various household products found in your home that may represent a potential hazard.
- 2-2. Analyze RECORDED DATA based on accurate observations of performed activities in this section concerned with some of the household products found in your home.

IBM.

Data Processing Division

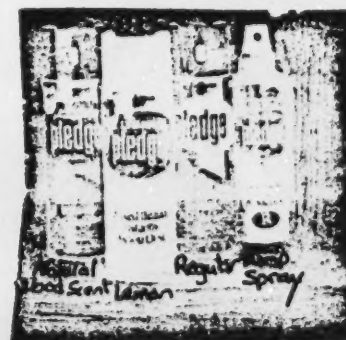


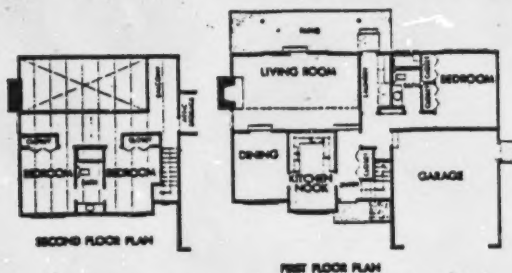


DO THE FOLLOWING ACTIVITIES:

- 2-1. Strictly from memory, LIST all the main living areas that make up your home. Without actually going through the house, try not to overlook any part of the total home. BE sure to include the garage, porch, storage shed, and yard. These areas may technically be out-of-doors, but are to be included.
- 2-2. Using the list you prepared in ACTIVITY 2-1 and strictly from memory, IDENTIFY what living areas you think the below household products may be located. NOTE that the household products are given a general name to the left with examples of those products to the right. You are to use the general name to the left. Place this name to right of the living areas in ACTIVITY 2-1.

AEROSOL SPRAYS.....deodorants, medicines, shaving cream.
 DETERGENTS.....general purpose, laundry, synthetic.
 PESTICIDES.....insecticides, herbicides, rodenticides.
 FURNITURE POLISHES....solvent, emulsion, or aerosol types.
 DISINFECTANTS.....reduces but does not kill all germs.
 SOLVENTS.....substances that dissolve other things.
 CLEANERS.....ovens, drains, windows, specialized.
 PLASTICS.....food containers, toys, fillers.
 GERMICIDES.....more potent than disinfectants.
 MOTOR VEHICLE PRODUCTS. deicers, oils, cleaners, antifreeze.
 HOBBIES, CRAFTS, ARTS. glues, cements, paints, photochemicals.
 FLOOR POLISHES.....also cleaners, waxes, various forms.
 SOAP.....natural, sodium or potassium salts.
 BUILDING MATERIALS....chaulking compounds, asbestos, insulation.
 CLOTHING CARE PRODUCTS. antistatics, spot removers, starches.
 PAINT.....oil or lead-based? mercury antifungicides.
 HEAVY METALS.....lead gasoline, thermometers, paints.
 GASOLINE.....unleaded or leaded.
 FABRIC CARE PRODUCTS..spot removers, stain protectors.





Living area: 598 sq. ft.
Storage area: 180 sq. ft.

Living area: 1155 sq. ft.
Garage area: 450 sq. ft.

DO THE FOLLOWING ACTIVITY

- 2-3 Using Information Sheet 2-1 as a guide, DRAW a floor plan of your house. Precise floor dimensions are not necessary for your drawing. It is more important to include all the living areas of your house. You may want to refer back to the list you prepared from memory in ACTIVITY 2-1. Graph paper may make this task easier.
- 2-4 Using Information Sheet 2-2 as a guide and the drawing you prepared in ACTIVITY 2-3, go to each living area and take an inventory by LISTING the type of household product along with the number of each product and the brand names. Also list any warnings to users.
- 2-5 Using the code letter provided in parenthesis of each of the classes of household products mentioned on Information Sheet 2-2, indicate that code letter on the drawing you made in ACTIVITY 2-3. Next to the code letter indicate the number of each product you found in ACTIVITY 2-4.



DO ONE OF THE FOLLOWING:

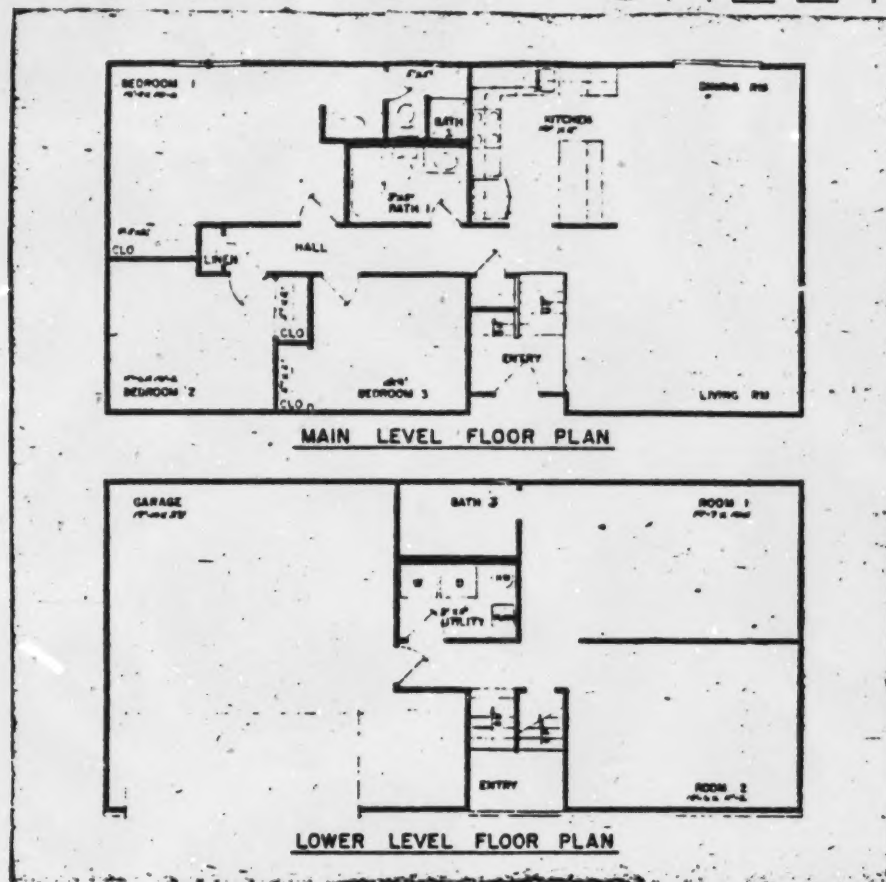
- 2-6. Using your list you prepared for ACTIVITY 2-4, note which class of household products tend to have the most warnings to consumer. Go back to each of those products and LIST the ingredients that they contain. IDENTIFY the ingredient or common ingredients that are found in the products. FORM a hypothesis that links that ingredient to a common warning.
- 2-7. Using the drawing you prepared for ACTIVITY 2-5, note which living area(s) contain the most number of household products. From ACTIVITY 2-4, which living area has the largest number of products with label warnings. FORM a hypothesis that is concerned with the relative safety of the area compared to the rest of the house.



BEST COPY AVAILABLE

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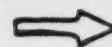
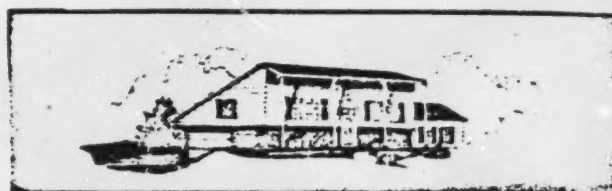
INFORMATION SHEET 2-1



IT IS NOT NECESSARY THAT THE FLOOR PLAN OF YOUR HOUSE BE AS EXACT AS THE ABOVE EXAMPLE. PLEASE NOTE THAT THE ABOVE PLANS REPRESENT A TWO-STORY HOUSE WITH AN ATTACHED GARAGE.

BE SURE TO INCLUDE THE FOLLOWING AREAS IN YOUR DRAWING. IT IS UP TO YOU WHETHER YOUR DRAWING IS TO SCALE OR NOT.

- | | |
|------------------------------------|-----------------------------------|
| 1. ATTIC | 8. GARAGE (ATTACHED OR DETACHED) |
| 2. BACK PORCH | 9. KITCHEN |
| 3. BASEMENT | 10. LIVING, FAMILY, DINING AREAS |
| 4. BATHROOM(S) AND SHOWER(S) | 11. RECREATIONAL AREAS |
| 5. BEDROOM(S) AND SLEEPING AREA(S) | 12. UTILITY AREAS (WASHING, ETC.) |
| 6. CLOSETS AND STORAGE AREAS | 13. SHOP OR WORK AREAS |
| 7. COOLING AND HEATING AREAS | 14. STUDY, DEN, OR HOBBY AREAS |



INFORMATION SHEET

2 - 2

THIS PAGE CONTAINS A SUGGESTED LISTING THAT ATTEMPTS TO DIVIDE HOUSEHOLD PRODUCTS INTO SOME BASIC CLASSES. YOU MAY WANT TO MODIFY THIS LIST TO BETTER FIT YOUR SITUATION. IN SUCH A CASE YOU SHOULD DISCUSS THE MODIFICATION WITH YOUR INSTRUCTOR. THIS SHEET SHOULD BE HELPFUL TO YOU SHOULD YOU DECIDE TO USE ANOTHER CLASSIFICATION SYSTEM.



AEROSOL SPRAYS...(A)...These are products that contain a chemical or several chemicals referred to as an active ingredient which is packed under pressure with a liquid or gaseous chemical that serves as a propellant. The active ingredient provides the service of the product, for example; deodorant, deicers, shaving cream, window cleaners, oven cleaners. They emit airborne particles of less than one micrometer called aerosols.

BUILDING MATERIALS.(B).These are products that are used in construction of homes. It represents a broad category of materials such as; asbestos, fiberglass. These products are present in shingles, wallboard, insulation, drapes, filters, cement, siding, brake lining.

CLOTHING AND FABRIC CARE PRODUCTS.....(C)...

These are products that include; dry-cleaning fluids, spot removers, shoe care products, fabric finishes, spray starch, fabric cements, suede renewers, rug and carpet cleaners.

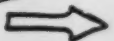
DUST.....(D)...A very broad and general term used here to refer to particles that are between one and five micrometers in size. Be honest in reporting this and use your own judgment in deciding an acceptable level of dust.

HEATING AND COOLING DEVICES.....(E)...

This category is concerned with appliances such as; gas stoves and furnaces, grills, refrigerators, auto and home air conditioners.

FURNITURE AND

FLOOR POLISHES....(F)...Includes cleaners, polishes, and waxes of furniture and floors.





GARBAGE AND SOLID WASTE PRODUCTS.....(G)..

This category includes appliances, utensils, and products associated with garbage and trash, such as; garbage disposals, trash cans, garbage bags, etc. The actual trash and garbage represent externalities of our daily activities in our homes.

HOBBIES, ARTS AND CRAFTS.....(H)..

Activities such as metalwork, pottery, plasticrafts, photography, woodworking, painting, furniture refinishing, printing, china painting, etc. usually incorporate various solvents, chemicals, pigments, or dust producing tasks.

PESTICIDES.....(I)..

These products are used to get rid of or help control such living organisms as insects, fungi, plants, nematodes, and small mammals that are unwanted or undesirable. They may represent life forms that cause or present environmental, economic, or health problems. The pesticides are classified according to the pest they are used against, for example; insecticides, herbicides, fungicides, rodenticides, etc.

DISINFECTANTS AND GERMICIDES.....(J)..

These products are concerned with the control of bacteria and other possible disease causing microorganisms. The main difference between the two is that germicides tend to kill off more organisms.



SOAPS AND

DETERGENTS.....(K)..



These terms are somewhat confusing since ordinary soap is a detergent cleanser. To distinguish the two we need to take a look at what each contains. Natural soap is a water soluble mixture of sodium or potassium salts of fatty acids. When one thinks of detergents we often think of something artificial or synthetic. The ingredients are varied but to identify a few look for the following: surfactants, LAS (linear alkylate sulfonate), phosphates, optical brighteners, sodium silicates.





LEAD.....(L)...Possible sources of lead may be present in yellow lacquered pencils, candle wicks, unfired glazed homemade pottery, lead-glazed pottery, solder, leaded water pipes, tobacco smoke, some paints (depends on how old the paint is). Note that not all the above mentioned products may contain lead-based substances today.

MOTOR VEHICLE

PRODUCTS.....(M)...Examples of these products would be; oils, gasoline, antifreeze, battery additives, gasket shellac, antiknock agents, dyes, antirust agents, upholstery cleaners.

NOISE DEVICES.....(N)...This category refers to any appliance or device that produces noise at varying levels per product, such as; blenders, garbage disposal, dishwasher, hair dryer, lawn mowers, washer/dryer, stereo, TV.

CHEMICAL HOUSEHOLD

CLEANERS.....(O)...These products are specialized cleaners that may contain very powerful chemicals. Examples would be oven and drain cleaners, window and toilet cleaners, dishwashing detergents, wax removers, denture cleaner, scouring powders, bathroom tile and tub, bleaches.



PLASTICS AND

PLASTICIZERS.....(P)...Plastics are becoming increasingly more difficult to define in a manner that would apply to all the products that they are used in. For that reason examples may serve just as well as a definition. A few examples are; nylons, polyesters, lacquers, pipes, flooring materials, toys, telephones, rugs, foams, adhesives, furniture, electrical insulators, vinyls. A plasticizer is usually present in most plastics. It serves to increase the plastic's workability and potential to stretch.





HEAVY METALS.....(Q)..The substances may represent by-products of some activity we perform in our homes. They may be present in pure forms but more than likely will exist as compounds. Because we are talking about several metals here, we shall be more specific than we have been in other categories.

MERCURY-thermometers, fungicides of seeds or water-based paints, especially some latex types.

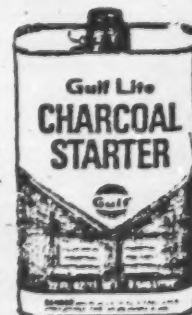
CADMIUM-sea foods, grains, meat products, yellow and orange pigmented paint tobacco, PVC plastics, agricultural chemicals and fertilizers.

BERYLLIUM-some mantle-type camp lanterns.

SELENIUM-may be present in red, yellow, or orange paints.

RADIATION.....(R)..Radiation may be the resulting product of some other appliance or device. We are talking about long-term, low-level radiations that may be produced by the following potential sources: television sets, sun lamps, black lights, fluorescent lights, ionization-type fire detectors, false teeth, and eyeglasses.

SOLVENTS.....(S)..A solvent is any substance that dissolves another substance. This substance may be in any of the three physical states of matter, but is most often considered in the liquid state. Water is the best solvent known to dissolve the most substances. Other solvents contain petroleum ethers, benzenes, toluenes, xylenes, methanols, ethanol, propanol, acetones, acetates, pine oils, turpentine, terpenes.



SELF-CHECK



NOW THAT YOU HAVE COMPLETED THE SECOND SECTION OF THE LEARNING CAPSULE, IT IS TIME TO CHECK YOURSELF TO FIND OUT IF YOU HAVE ACCOMPLISHED ALL OF THE OBJECTIVES FOR THIS SECTION.

WITHOUT REFERRING BACK TO YOUR NOTES OR RESOURCES, ANSWER THE FOLLOWING QUESTIONS ON NOTEBOOK PAPER. WHEN YOU HAVE FINISHED THE SELF-CHECK, YOU SHOULD REFER BACK TO YOUR NOTES OR OTHER RESOURCES TO CHECK FOR CORRECT OR INCORRECT ANSWERS. DO NOT CHANGE ANY INCORRECT ANSWERS AT THIS POINT. THE RESULTS OF THIS SECTION MAY VARY FROM STUDENT TO STUDENT SO BE CONCERNED ONLY WITH YOUR RESULTS. REFER TO THE FLOW CHART IN THE SPECIAL INSTRUCTIONS SECTION AT THE FRONT OF THE CAPSULE FOR FURTHER DIRECTIONS.

1. Where are most of the hazardous household products located in your home?
2. What class of household products seem to be the most hazardous?
3. Describe at least two ways that your home environment could be made safer, in regard to the chemicals used in your home.

CHECK WITH YOUR
INSTRUCTOR

STOP